

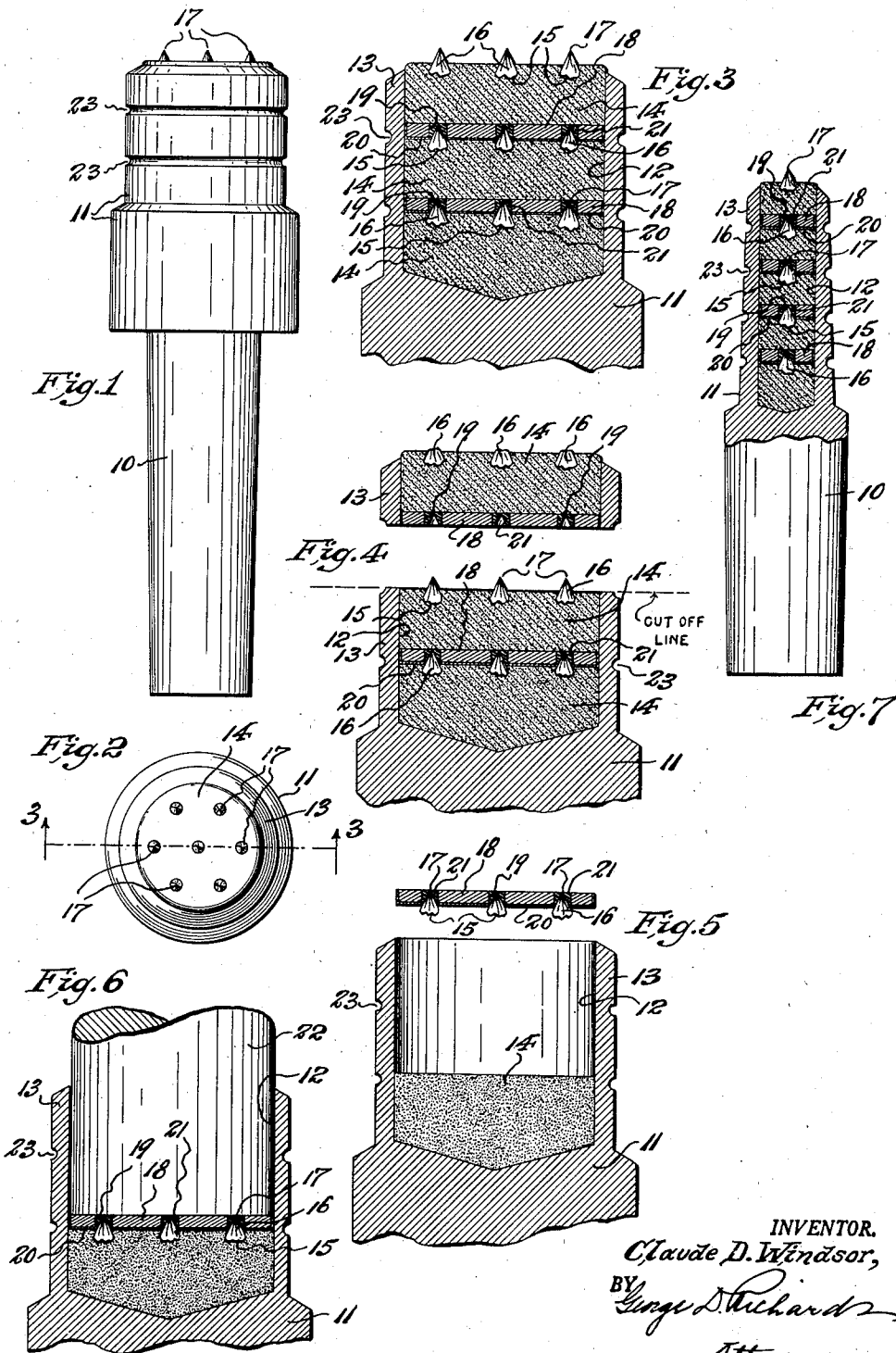
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DIAMOND TOOL

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DIAMOND TOOL

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This invention relates to a novel form of diamond tool, the diamonds of which are so set and arranged that selected ends or points thereof, best adapted for efficient work, are disposed for projection from the working end of the tool; said diamonds being imbedded in the body of the tool in axially spaced successive relation, whereby, when an outermost diamond or group thereof is worn away, the tool may be cut off to expose for use the next succeeding diamond or group thereof.

This invention has for an object to provide a novel diamond tool as above characterized wherein the working ends or points of interior diamonds or groups thereof are protected by perforate guard disc elements which are readily separable therefrom and from the tool body when said interior diamonds or groups thereof are exposed for use.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of the invention are shown in the accompanying drawings, in which:

Fig. 1 is a side elevational view of one form of diamond tool according to this invention; Fig. 2 is an outer end elevational view of the same; and Fig. 3 is a longitudinal sectional view of the working end portion of said diamond tool, taken on line 3—3 in Fig. 2, but drawn on an enlarged scale.

Fig. 4 is a view similar to that of Fig. 3, but showing the method of cutting down the operative end portion of the tool in order to expose for service a succeeding group of the diamonds thereof.

Figs. 5 and 6 are views similar to that of Fig. 3, but respectively showing certain steps of the process or method employed in the production of the tool.

Fig. 7 is a longitudinal sectional view, in part elevation, of a modified form of the diamond tool of this invention.

Similar characters of reference are employed in the hereinabove described views, to indicate corresponding parts.

Referring to the drawings, the novel diamond tool, in one embodiment thereof as shown in Figs. 1 to 3 inclusive, comprises a shank 10 which terminates at its outer end in a head 11. Said shank and its head is made of a suitable metal, such e. g. as steel of desired character. The head 11 is counterbored to provide an axial chamber 12 extending inwardly thereinto from its

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outer end, thus providing relatively thin exterior side walls 13.

Arranged within the chamber 12 of the head 11 are successive matrix bodies or layers of setting material 14 in which the bases 15 of the diamonds 16 are embedded and held so that selected points 17 thereof project freely from the outer surfaces of said setting material. Overlying each interior matrix or layer of setting material 14 is a perforate guard disc 18 of a thickness substantially corresponding to the distance of projection of the diamond ends or points 17 from the surface of the setting material by which they are held; this distance, for example, being preferably of the order of fifty thousandths of an inch. The perforations 19 of said guard discs 18 are provided in diametric size best adapted to accommodate the sizes of diamonds selected for use in the tool; and said guard discs 18 are of diametric size somewhat less than the internal diameter of the chamber 12 of the tool head 11, so as to somewhat loosely fit within the same. The guard discs 18 are preferably made of cold rolled steel. That face of each guard disc 18 which is opposed to a matrix body or layer of setting material 14 is treated to render the same non-adherent to the latter, as e. g. by a coating 20 of suitable substance, such e. g. as ordinary machine oil.

The diamonds 16 are initially and temporarily affixed to the guard discs 18 by filling the perforations 19 of the latter with a mass of suitable plastic material 21, such e. g. as a suitable lacquer, in which the projecting points 17 of the diamonds are imbedded.

The novel method of setting successive, axially spaced layers or groups of diamonds in the described operative assembled relation to the tool head 11 comprises the following steps of procedure:

First, the perforate guard discs 18 are prepared and the openings or perforations 19 thereof are filled with the masses of plastic material 21, whereupon the diamonds 16 to be employed are inspected to ascertain the points 17 thereof best suited for efficient operation in performance of the work for which the tool is designed, and such selected points are pressed into the plastic filled openings or perforations so as to be imbedded therein, and so as to hold the diamonds in place and spaced relation while being assembled and set in the tool head 11. The bases 15 and the major portion of the bodies thereof, as thus assembled with the guard discs 18, will project freely from the underface of the latter.

The assembly of guard discs and diamonds having been prepared as stated, a first body or layer of the setting material 14, preferably comprising a selected metallic powder capable of being fused and solidified by heat, is deposited within the bottom of the chamber 12 of the tool head. The thickness or depth of said body or layer of metallic powder is of substantial dimension, so as to assure an adequate embracing mass thereof about the bases and major portions of the diamonds, when the latter are assembled therewith. After the body or layer of matrix forming metallic powder is deposited in the tool head chamber 12, a diamond and guard disc assembly, after first covering the underface of the guard disc with the adhesion resist coating 20, is inserted in the tool head chamber 12 with the diamond bases opposed to said body or layer of matrix forming metallic powder. The above described steps are indicated by the showing of Fig. 5 of the drawings.

The diamond and guard disc assembly having been inserted within the tool head chamber 12 over the body or layer of matrix forming metallic powder, pressure is applied to the outer face of the guard disc, whereby to both imbed the bases 15 of the diamonds 16 in said matrix forming metallic powder, while at the same time compacting the latter firmly and tightly around the diamond bases 15 thus imbedded therein. This may be done by a suitable tamping tool or ram 22 to which down-thrusting pressure, in the order of from two to four tons, is applied by suitable means. This is indicated by the showing of Fig. 6 of the drawings.

The described steps of procedure are repeated and carried out with respect to each successive set of diamonds with which the tool is to be provided, the number of which sets is subject to selective variation, as will be obvious. It will also be understood that the number and grouped relation of the diamonds of the sets thereof is also subject to selective variation.

After the several successive sets of diamonds have been arranged within the tool head as described, the tool is subjected to heat treatment at a temperature sufficient to fuse the matrix forming metallic powder, and thus consolidate it into a rigid hard mass in which the bases of the diamonds are gripped and strongly held against displacement, while at the same time welding or adhering the matrix mass to the body or walls of the tool head 11 and the uncoated top faces of any guard discs 18 which are in contact therewith, although the underfaces of said guard discs remain non-adhered to any underlying matrix masses, due to the adhesion resist coatings 20.

Upon completion of the heat treatment, and after the tool has cooled, the outer end of the head 11 is trimmed away to expose the outer sets or group of diamonds, from the projecting points of which the covering guard disc is removed, whereby to expose said points in operative projection from the external end of the tool head (see Fig. 3).

When, by use of the tool, the points of the outer set or group of diamonds become worn down or broken away, or the diamonds otherwise consumed, said outer matrix and set or group of diamonds may be removed, and a succeeding matrix and its set or group of diamonds exposed in position for use. This may be done by placing the tool in a lathe and cutting through the walls 13 of the head 11 in a plane substantially coincident with the underface of the guard

disc of the succeeding set or group of diamonds, whereby the matrix of the first set or group of diamonds, together with said guard disc of said succeeding set or group of diamonds may be detached, thus exposing the points of the latter set or group of diamonds in operative projection from the then outer end of the tool and ready for use. This is indicated by the showing of Fig. 4 of the drawings. The cut off lines for each successive set or group of diamonds may be visibly indicated on the exterior of the tool head by suitably located marking grooves 23 or the like. These operations may be repeated with respect to each succeeding set or group of diamonds with which the tool is equipped, until all sets or groups are consumed.

The provision of the guard discs not only contribute to simplification of the method by which successive sets or groups of diamonds are imbedded in the tool, as will be obvious from the above description of said method, but also afford further advantages with respect to the finished tool, viz. to assure uniform positioning of the diamonds of each set thereof in a desired selected grouped and spaced relation, and to further assure uniform projection of the best selected working points of said diamonds from the operative end of the tool when there exposed, not only with respect to the initially exposed outer set or group thereof, but also with respect to all succeeding sets or groups which are initially concealed. The latter advantage assures the user of the tool that initially concealed diamonds will be equal in quality and disposition for working efficiency to that of the initially exposed diamonds.

As shown in Fig. 7, the novel tool structure may be produced by the described method and furnished with the described guard discs in a form wherein the succeeding working sections of the tool each include but one diamond of selected size.

The diamond tool of this invention is adapted to effect various abrading operations, and is especially adapted for use as a dressing tool for turning emery and other types of grinding wheels.

Having now described my invention, I claim:

1. A diamond tool comprising a chambered tool head, a succession of axially spaced matrix masses fixed within said chambered tool head, at least one diamond imbedded in each matrix mass so that a working point thereof projects exteriorly from the outer face of the latter, and non-adherent perforate guard discs in contiguous relation to interior matrix masses, the perforations of said guard discs being engaged over and enclosing the working points of interior diamonds, said guard discs being separable from underlying adjacent matrix masses, whereby to free the working points of the diamonds preparatory to use thereof when the tool head is cut away to expose the same.

2. A diamond tool comprising a chambered tool head, a succession of axially spaced matrix masses fixed within said chambered tool head, at least one diamond imbedded in each matrix mass so that a working point thereof projects exteriorly from the outer face of the latter, perforate guard discs abutting outer faces of interior matrix masses whereby to receive and enclose the working points of diamonds which project from the latter, and said guard discs having a coating of adhesion resist substance on the faces thereof which oppose said matrix masses, whereby said guard discs are separable from said matrix masses

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so as to free the working points of the diamonds preparatory to use thereof when the tool head is cut away to expose the same.

3. A diamond tool comprising a chambered tool head, a succession of axially spaced matrix masses fixed within said chambered tool head, at least one diamond imbedded in each matrix mass so that a working point thereof projects exteriorly from the outer face of the latter, perforate guard discs abutting outer faces of interior matrix masses whereby to receive and enclose the working points of diamonds which project from the latter, and said guard discs having a coating of adhesion resist substance on the faces thereof which oppose said matrix masses, whereby said guard discs are separable from said matrix masses so as to free the working points of the diamonds preparatory to use thereof when the tool head is cut away to expose the same, said tool head having external indicating means to facilitate location of cut off points at which the tool head may be cut away to expose interior diamonds.

4. A diamond tool comprising a chambered tool head, an inner matrix mass and an outer matrix mass fixed within said tool head, at least one diamond imbedded in each matrix mass so that a working point of the diamond projects exteriorly from the outer face thereof, a non-adherent perforate guard disc in contiguous relation to the outer face of the inner matrix mass so as to engage over and enclose the working point of a diamond projecting therefrom, said guard disc being separable from said inner matrix mass whereby to free the working point of a diamond projecting from the latter when the tool head is cut away to expose said inner matrix mass.

5. A diamond tool comprising a chambered tool head, an inner matrix mass and an outer matrix mass fixed within said tool head, at least one diamond imbedded in each matrix mass so that a working point of the diamond projects exteriorly from the outer face thereof, a non-adherent guard disc in contiguous relation to the outer face of the inner matrix mass, said guard disc having an opening to receive the

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working point of a diamond projecting from said inner matrix mass, and a filling of plastic material within said guard disc opening by which said diamond working point is surrounded, said guard disc and filling being separable from said inner matrix mass and diamond working point which projects therefrom whereby to free the latter when the tool head is cut away to expose the inner matrix mass.

6. A diamond tool comprising a chambered tool head, a succession of axially spaced matrix masses fixed within said chambered tool head, at least one diamond embedded in each matrix mass so that a working point thereof projects exteriorly from the outer face of the mass, perforate guard discs respectively abutting outer faces of interior matrix masses whereby to receive and enclose the working points of diamonds which project from the latter, fillings of plastic material within the perforations of said guard discs by which the diamond working points housed in said perforations are surrounded, and said guard discs having coatings of adhesive resist substance on the faces thereof which oppose said matrix masses, said guard discs and fillings being separable from said matrix masses so as to free working points of the diamonds preparatory to use thereof when the tool head is cut away to expose the same.

7. A diamond tool as defined in claim 6, wherein the tool head is provided with external indicating means to facilitate location of cut off points at which the tool head may be cut away to expose interior diamonds.

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